



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

09/990,844

11/21/2001

Thomas Klingenbrunn

01P15526US

2700

7590

02/08/2006

Siemens Corporation  
Attn: Elsa Keller, Legal Administrator  
Intellectual Property Department  
186 Wood Avenue South  
Iselin, NJ 08830

EXAMINER

WARE, CICELY Q

ART UNIT

PAPER NUMBER

2634

DATE MAILED: 02/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/990,844

Applicant(s)

KLINGENBRUNN ET AL.

Examiner

Cicely Ware

Art Unit

2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-4 is/are allowed.
- 6) ☒ Claim(s) 5-7, 11-14 and 16-21 is/are rejected.
- 7) ☒ Claim(s) 8-10 and 15 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 November 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

***Response to Arguments***

1. Applicant's arguments, see REMARKS, filed 11/23/2005, with respect to the rejection(s) of claim(s) 5, 6, 7, 11 and 12 under 35 USC 102(a) and 13 and 19 under 35 USC 102(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Sexton (US Patent 2003/0048838).

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. Claims 5, 6, 7, 11, 12 are rejected under 35 U.S.C. 102(a) as being anticipated by Traeber (PCT WO01/11842) (columns and figures listed below are provided by the US translation of Traeber (US Patent 6,813,744)) .

(1) With regard to claim 5, Traeber discloses a method of determining a reduced trellis from a sequence of symbols in a Viterbi detector comprising the steps of:  
determining the value (best path metric) of a previous symbol from the sequence of symbols; and generating said reduced trellis by calculating only path metrics (best path

metric) for states in which the previous symbol has the determined value (col. 2, lines 18-30).

(2) With regard to claim 6, claim 6 inherits all the limitations of claim 5. Traeber further discloses wherein the step of determining comprises the steps of: determining at least one symbol from a previous determination including a plurality of current states (Fig. 4, col. 1, lines 36-50, 31-34); determining destination states for the determined symbol and determining a surviving path metric by comparing path metrics originating from the states of the determined symbol (Fig. 5, col. 2, lines 39-52, 62-67- col. 3, lines 1-10); and determining the value of a previous symbol with respect to the determined symbol of the surviving state (Fig. 5, Fig. 7, col. 3, lines 19-30).

(3) With regard to claim 7, claim 7 inherits all the limitations of claim 6. Traeber discloses in (Fig. 4) wherein the previous symbol is the oldest symbol (t) (col. 2, lines 62-67 – col. 3, lines 1-10)

(3) With regard to claim 11, see rejection claims 5 and 6.

(4) With regard to claim 12, claim 12 inherits all the limitations of claim 11. Traeber further discloses in (Fig. 5 and 7 (ACS)) means for determining and said calculation means are implemented by a digital signal processor (col. 4, lines 40-60).

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 13, 14, 16-18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sexton et al. (US Patent Application 2003/0048838) in view of Malkov et al. (US Patent Application 2003/0053535), as applied to claims 13 and 19.

(1) With regard to claim 13, Sexton et al. discloses in (Fig. 3) an arrangement for determining a trellis from a sequence of symbols comprising: a plurality of equalizers receiving (334, 332) said sequence of symbols (320) each generating a trellis (Pg. 5, col. 2, lines 9-14); a select unit for activating one of the equalizers (331); a control unit (320) receiving said sequence of symbols and for determining a power distribution of said sequence of symbols and controlling said select unit depending on said power distribution (Fig. 5) (Pg. 3, col. 1, lines 57-64, col. 2, lines 33-40, 47-65, Pg. 4, col. 1, lines 7-30, 36-41, Pg. 5, col. 1, lines 19-25, col. 2, lines 1-14).

However Sexton et al does not explicitly disclose each equalizer generating a trellis.

However Malkov et al. discloses each equalizer generating a trellis. Malkov et al. discloses that DFE uses trellis diagrams and MLSE uses a reduced-state maximum likelihood trellis and DDFSE employs a non-zero delay reduced state trellis calculation (Malkov et al. (US Patent Application 2003/0053535) Pg. 1, col. 1, lines 48-59, 66-67- col. 2, lines 1-12, 21-53).

Therefore it would have been obvious to one of ordinary skill in the art to modify Sexton et al. in view of Malkov et al. to incorporate each equalizer generating a trellis for

better performance in weak channel coding schemes and mitigate ISI (Malkov et al., Pg. 1, col. 1, lines 33-43).

(2) With regard to claim 19, see rejection of claim 13.

(3) With regard to claim 14, claim 14 inherits all the limitations of claim 13.

Malkov et al. further discloses Viterbi equalizer receiving said sequence of symbols generating a first trellis; a tap-selectable Viterbi equalizer receiving said sequence of symbols generating a second trellis and a delayed decision feedback sequence estimator receiving said sequence of symbols generating a first trellis. Examiner asserts that the Viterbi equalizer is used for MLSE detection (Pg. 1, col. 1, lines 27-35, 37-39, 42-43, 47-58).

(2) With regard to claims 16, claim 16 inherits all the limitations of claim 14. See rejection of claim 14.

(3) With regard to claim 17, claim 17 inherits all the limitations of claim 13. See rejection of claim 14.

(4) With regard to claim 18, claim 18 inherits all the limitations of claim 13. See rejection of claim 14.

5. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sexton et al. (US Patent Application 2003/0048838) in view of Malkov et al. (US Patent Application 2003/0053535), as applied to claim 19, in view of Pirainen (US Patent Application 2003/0058974).

(1) With regard to claim 20, claim 20 inherits all the limitations of claim 19. However Sexton et al. in combination with Malkov et al. do not disclose a control unit determines which one of said plurality of equalizers will receive said sequence of symbols and generate a trellis to output.

However Pirainen discloses a control unit determines which one of said plurality of equalizers will receive said sequence of symbols and generate a trellis to output (Pg. 4, col. 1, lines 4-9, col. 2, lines 8-13, 39-44).

Therefore it would have been obvious to one of ordinary skill in the art to modify Sexton et al. in combination with Malkov et al. in view of Pirainen to incorporate a control unit determines which one of said plurality of equalizers will receive said sequence of symbols and generate a trellis to output in order to maintain the best possible quality of the signal irrespective of channel quality and coding scheme used for error correction and detection (Pirainen, Pg. 1, col. 2, lines 25-29)

(2) With regard to claim 21, claim 21 inherits all the limitations of claim 19. Pirainen further discloses a control unit determines which one of the trellis generated by said plurality of equalizers receiving said sequence of symbols is output (Pg. 4, col. 1, lines 4-9, col. 2, lines 8-13, 39-44).

### ***Allowable Subject Matter***

6. Claims 8-10, 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a

statement of reasons for indication of allowable subject matter: The instant application discloses a method of reducing the number of path metric calculations in the trellis of a Viterbi equalizer receiving a sequence of symbols. Prior art references show similar methods but fail to teach: **“wherein the sequence comprises  $n$  symbols and said previous symbols are a sub-sequence of  $n-1$  symbols and said preliminary decision of at least one symbol comprises a sub-sequence of up to the last  $n-2$  symbols”**, as in claim 8; **“wherein said method is executed depending on power distribution”**, as in claim 9; **“wherein the sequence comprises  $n$  symbols and said previous symbols are a sub-sequence of  $n-1$  symbols and said preliminary decision of at least one symbol comprises a sub-sequence of up to the last  $n-2$  symbols and wherein the power distribution of said  $n-2$  symbols is below a predefined threshold”**, as in claim 10; **“means for determining at least one symbol from a previous determination assigned to a first state”**, as in claim 15.

7. Claims 1-4 are allowed.

8. The following is a statement of reasons for the indication of allowable subject matter: The instant application discloses a method of reducing the number of path metric calculation in the trellis of a Viterbi equalizer receiving a sequence of symbols. Prior art references show similar methods but fail to teach: **“identifying a subset of destination states which are excluded from path metric calculations and determining for each of the remaining destination states a survivor path by comparing all path metrics to this state”**, as in claim 1.



***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Cicely Ware whose telephone number is 571-272-3047. The examiner can normally be reached on Monday – Friday, 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chieh Fan can be reached on 571-272-3042. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9314 for regular communications and 703-872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-3900.

***Cicely Ware***

cqw  
February 6, 2006

  
CHIEH M. FAN  
SUPERVISORY PATENT EXAMINER